WHAT IS CLAIMED IS:

1. A method for extracting a channel from a data stream, said method consisting of a modified fast convolution algorithm, said modified fast convolution algorithm consisting of a common-channel part common to all channels followed by a channel-specific part, said channel-specific part characterized by:

selecting a range of *n* Discrete Fourier Transform bins around the center frequency of the channel;

multiplying said bins with a frequency response; and

performing an N_{IDFT}-point Inverse Discrete Fourier Transform on these *n* data points; and

performing a signal processing step.

2. The method of Claim 1 further characterized wherein:

said common-channel part of said modified fast convolution algorithm has

a step of performing a N_{FFT}-Point Fast Fourier Transform on overlapping blocks of said data stream.

3. The method of Claim 2 further characterized wherein:

said N_{FFT}-point Fast Fourier Transform in said common-channel part of said modified fast convolution algorithm is preceded by steps of

first processing said data stream by a η% overlap block generator; and

second, multiplexing said data stream to form a complex signal;

while said channel-specific part of said modified fast convolution algorithm has

a first step of performing extraction of said bins;

a second step of performing said multiplication of said bins with said frequency response;

a third step of performing an N_{IDFT}-point Inverse Discrete Fourier Transform on these *n* data points; and

a fourth step of processing said digital data stream by a η% overlap block combiner.

4. The method of Claims 1-3 further characterized wherein said frequency response has a limited range.

5. The method of Claims 3 or 4 wherein said η% overlap block generator is further characterized wherein:

said blocks are generated using an overlap/add process which chops said data stream into non-overlapping sections of length $N_{FFT}*(1-\eta)$ and padded with $N_{FFT}*\eta$ zeros to form a single block.

6. The method of Claims 3 or 4 wherein said η% overlap block generator is further characterized wherein:

said blocks are generated using an overlap/save process which chops said data stream into a series of blocks of length N_{FFT}, each of which has an overlap with the previous block in the series given by a length of $N_{FFT}*\eta$.

7. The method of Claims 3 or 4 wherein said η% overlap block combiner is further characterized wherein:

said data stream is processed using an overlap/add process wherein said blocks are overlapped with the previous block by a length equal to $N_{IDFT}*\eta$, the overlapping part of a block is

added to the previous block's corresponding overlapping part to produce the output data stream.

8. The method of Claims 3 or 4 wherein η% overlap block combiner is further characterized wherein:

said data stream is processed using an overlap/save process wherein said blocks are overlapped with the previous block by a length equal to $N_{IDFT}*\eta$, the overlapping parts of the blocks are discarded said output data stream being form from the non-overlapping parts of the blocks.

9. The method of Claims 3 or 4 wherein said multiplexing step is further characterized by:

producing a complex signal z(t)=x(t)+j*y(t), where x(t) and y(t) are two consecutive blocks.

10. The method of Claim 9 further characterized wherein:

said sequence y(t) is also rotated.

11. The method of Claim 3 further characterized wherein:

said N_{FFT}-point Fast Fourier Transform is a pipeline architecture with a power of 2 and said bin extraction reorders the output from the Fast Fourier Transform and selects only the bins needed.

12. A method for inserting a channel into a data stream, said method consisting of a modified fast convolution algorithm, said modified fast convolution algorithm consisting of a channel-specific part followed by a common-channel part common to all channels, said channel-specific part characterized by:

performing a signal processing step;

performing an N_{DFT}-point Discrete Fourier Transform on said stream;

multiplying said stream with a frequency response; and

inserting a range of *n* Fast Fourier Transform bins around the center frequency of the channel.

13. The method of Claim 12 further characterized wherein:

said common-channel part of said modified fast convolution algorithm has a step of performing a N_{IFFT}-point Inverse Fast Fourier Fast Transform on overlapping blocks of said data stream.

14. The channelizer of Claim 13 further characterized wherein:

said channel-specific part of said modified fast convolution algorithm has

a first step of processing said digital data stream by a η% overlap block generator;

followed by said step of performing a Discrete Fourier Transform; followed by

a third step multiplying the result of said Discrete Fourier Transform with the filter frequency coefficients; and

a fourth step of inserting said bins around the center frequency of the channel;

while said common-channel part of said modified fast convolution algorithm has

said step of performing am N_{IFFT}-point Inverse Fast Fourier followed by a second step of de-multiplexing the output from said N_{IFFT}-point Inverse Fast Fourier Transform to form a real signal; and

a third step of processing said digital data stream by a η% overlap block combiner.

15. The method of Claims 12-14 further characterized wherein said frequency response has a limited range.

16. The method of Claims 14 or 15 wherein said η% overlap block generator is further characterized wherein:

said blocks are generated using an overlap/add process which chops said data stream into non-overlapping sections of length $N_{FFT}*(1-\eta)$ and padded with $N_{FFT}*\eta$ zeros to form a single block.

17. The method of Claims 14 or 15 wherein said η% overlap block generator is further characterized wherein:

said blocks are generated using an overlap/save process which chops said data stream into a series of blocks of length N_{FFT}, each of which has an overlap with the previous block in the series given by a length of $N_{FFT}*\eta$.

18. The method of Claims 14 or 15 wherein said η% overlap block combiner is further characterized wherein:

said data stream is processed using an overlap/add process wherein said blocks are overlapped with the previous block by a length equal to $N_{IDFT}*\eta$, the overlapping part of a block is added to the previous block's corresponding overlapping part to produce the output data stream.

19. The method of Claims 14 or 15 wherein η% overlap block combiner is further characterized wherein:

said data stream is process using an overlap/save process wherein said blocks are overlapped with the previous block by a length equal to $N_{IDFT}*\eta$, the overlapping parts of the blocks

are discarded said output data stream being form from the non-overlapping parts of the blocks.

20. The method of Claims 14 or 15 further characterized wherein:

said bins are inserted into said Inverse Fast Fourier Transform in a symmetrical way where $Z(k_{start}+k)=X(k)$ and $Z(N_{IFFT}-k_{start}-k)=X'(k)$, Kstart being where the first bin of the channel is to be inserted and K is an integer from $0 \rightarrow N-1$, said bins for a given channel given by $X(0) \rightarrow X(N-1)$ where $X'(k)$ is the complex conjugate of $X(k)$ and being inserted into said Inverse Fast Fourier Transform in the order $X(0) \rightarrow X(N-1)$.

21. The method of Claims 14 or 15 further characterized wherein:

said bins are inserted into said Inverse Fast Fourier Transform by $Z(k_{start}+k)=X(k)+jY(k)$ and $Z(N_{IFFT}-k_{start}-k)=X'(k)+jY'(k)$, Kstart being where the first bin of the channel is to be inserted and K is an integer from $0 \rightarrow N-1$, said bins for a given channel given by $X(0) \rightarrow X(N-1)$ where $X'(k)$ is the complex conjugate of $X(k)$ and being inserted into said Inverse Fast Fourier Transform in the order $X(0) \rightarrow X(N-1)$.

22. The method of Claims 1-21 further characterized wherein:

said signal processing block consists of a combination at least one of the following: numerically controlled oscillators, time domain resampling, frequency domain resampling, matched channel filters, digital filtering means, standard fast convolution algorithms and modified fast convolution algorithms.

23. An apparatus for extracting a channel from a data stream, said apparatus comprising a modified fast convolution algorithm means and a signal processing means, said modified fast convolution algorithm means consisting of a common-channel part common to all channels and a channel-specific part, characterized wherein:

said common-channel part consists of

an η% overlap block generator;

a multiplexing means;

means for performing an N_{FFT}-point Fast Fourier Transform;

and said channel-specific part consists of

means for performing selection and extraction of bins around the center frequency of the channel;

means for multiplication of said bins with a frequency response;

means for performing an N_{IFFT}-point Inverse Fast Fourier Transform on the n data points; and

a η% overlap block combiner.

24. An apparatus for inserting a channel into a data stream, said apparatus consisting of two parts, a signal processing part and a modified fast convolution algorithm part, said modified fast convolution algorithm part consisting of a part common to all channels and a channel-specific part, characterized by

said channel-specific part consisting of

a η% overlap block generator;

means for performing a Discrete Fourier Transform;

means for multiplying the result of said Discrete Fourier Transform with the filter frequency coefficients; and

means for inserting bins around the center frequency of the channel;

and said common-channel part consisting of

means for performing an N_{IFFT}-point Inverse Fast Fourier Transform on said bins;

means for de-multiplexing the output from said Inverse Fast Fourier Transform; and

a η% overlap block combiner.